<110> Clark, Theodore G.
Dickerson, Jr., Harry W.
Lin, Tian-Long

<120> DIAGNOSTIC AND PROTECTIVE ANTIGEN GENE SEQUENCES OF ICHTHYOPHTHIRIUS

<130> 235.00170101

<140> 09/497,967
<141> 2000-02-04

<150> 60/131,121
<151> 1999-04-27

<150> 60/118,634
<151> 1999-02-04

<150> 60/122,372
<151> 1999-03-02

<150> 60/124,905
<151> 1999-03-17

<160> 102

<170> PatentIn Ver. 2.1

<210> 1
<211> 1326
<212> DNA
<213> Ichthyophthirius multifiliis

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cttggtactt gtgttaattg cagacctaat ttttactata atggtggtgc tgcttaagga 180
gaagctaatg gtaattaacc tttcgcagca aataatgctg ctagaggtat atgtgtacca 240
tgccaaataa acagagtagg ctctgttacc aatgcaggtg acttagctac tttagccaca 300
taatgcagta cttaatgtcc tactggcact gcacttgatg atggagtgac agatgttttt 360
gatagatcag ccgcataatg tgttaaatgc aaacctaact tttactataa tggtggttct 420
ccttaaggtg aagctcctgg cgtttaagtt tttgctgctg gtgctgccgc tgcaggtgtt 480
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cttgatgatg gagtgacact tgtttttaat acatcagcca cattatgtgt taaatgcaga 660
cctaactttt actataatgg tggttctcct taaggtgaag ctcctggcgt ttaagttttt 720
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<211> 2486
<212> DNA
<213> Ichthyophthirius multifiliis

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ttaaaataat gaatcgatat tatataaatt tttatttttt ataaaatatt gaattaccta 240
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tatttctaat ttttttttata attattaaaa aaaaaaaaaa aatctattac tattttgcat 360
ttacaaacga tagaaaaaac taaaatttat aatattatta aaaaaaaaaa tataaataat 420
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tcttattaaa ataaatacat aaattctagt tgattctttt ttaatattaa tttaaaatta 2040
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atttatttat aacactaaaa gaattc 2486

<210> 3
<211> 1404
<212> DNA
<213> Ichthyophthirius multifiliis

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cctgcaaatt gtgttaattg ttagaaaaac ttttattata ataatgctgc tgctttcgtt 180
cctggtgcta gtacgtgtac accttgtcca taaaaaaaag atgctggtgc ttaaccaaat 240
ccacctgcta ctgctaattt agtcacataa tgtaacgtta aatgccctgc tggtaccgca 300
attgcaggtg gagcaacaga ttatgcagca ataatcacag aatgtgttaa ttgtagaatt 360
aatttttata atgaaaatgc tccaaatttt aatgcaggtg ctagtacatg cacagcttgt 420
ccggtaaaca gagttggtgg tgcattgact gctggtaatg ccgctaccat agtcgcataa 480

tgtaacgtcg catgtcctac tggtactgca cttgatgatg gagtaactac tgattatgtt 540
agatcattca cagaatgtgt taaatgtaga cttaactttt actataatgg taataatggt 600
aatactcctt tcaatccagg taaaagttaa tgcacacctt gtccggcaat taaacctgct 660
aatgttgctt aagctacttt aggtaatgat gctacaataa ccgcataatg taacgttgca 720
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cctgaatctg ctaaaaaaaa tatataatgt gatttcgcta atttttatc aatttcctta 1380
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<210> 4
<211> 100
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 4
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tttatcgatt tccttattat ttatttcttt ctatttattg 100

<210> 5
<211> 1404
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: synthetic
55kD i-antigen coding region

<400> 5
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cctgctaact gtgtgaactg tcagaagaac ttctactaca acaacgctgc tgctttcgtg 180
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cgctctttca ccgagtgtgt gaagtgtcgc ctgaacttct actacaacgg aaacaacgga 600
aacacccctt tcaaccctgg aaagtctcag tgtacccctt gtcctgctat caagcctgct 660
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<210> 6
<211> 442
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 6
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Glu Leu Arg Ala Val Pro Cys Pro Asp Gly Thr Gln Thr Gln Ala Gly
             20                  25                  30

Leu Thr Asp Val Gly Ala Ala Asp Leu Gly Thr Cys Val Asn Cys Arg
         35                  40                  45

Pro Asn Phe Tyr Tyr Asn Gly Gly Ala Ala Gln Gly Glu Ala Asn Gly
     50                  55                  60

Asn Gln Pro Phe Ala Ala Asn Asn Ala Ala Arg Gly Ile Cys Val Pro
 65                  70                  75                  80

Cys Gln Ile Asn Arg Val Gly Ser Val Thr Asn Ala Gly Asp Leu Ala
                 85                  90                  95

Thr Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr Ala Leu
            100                 105                 110

Asp Asp Gly Val Thr Asp Val Phe Asp Arg Ser Ala Ala Gln Cys Val
        115                 120                 125

Lys Cys Lys Pro Asn Phe Tyr Tyr Asn Gly Gly Ser Pro Gln Gly Glu
    130                 135                 140

Ala Pro Gly Val Gln Val Phe Ala Ala Gly Ala Ala Ala Ala Gly Val
145                 150                 155                 160

Ala Ala Val Thr Ser Gln Cys Val Pro Cys Gln Leu Asn Lys Asn Asp
                165                 170                 175

Ser Pro Ala Thr Ala Gly Ala Gln Ala Asn Leu Ala Thr Gln Cys Ser
            180                 185                 190

Asn Gln Cys Pro Thr Gly Thr Val Leu Asp Asp Gly Val Thr Leu Val
        195                 200                 205

Phe Asn Thr Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr
    210                 215                 220

Tyr Asn Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe
225                 230                 235                 240

Ala Ala Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys
                245                 250                 255

Val Pro Cys Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala
            260                 265                 270

Gln Ala Asn Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr
        275                 280                 285

Ala Ile Gln Asp Gly Val Thr Leu Val Phe Ser Asn Ser Ser Thr Gln
    290                 295                 300
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Cys Ser Gln Cys Ile Ala Asn Tyr Phe Phe Asn Gly Asn Phe Glu Ala
305                 310                 315                 320

Gly Lys Ser Gln Cys Leu Lys Cys Pro Val Ser Lys Thr Thr Pro Ala
                325                 330                 335

His Ala Pro Gly Asn Thr Ala Thr Gln Ala Thr Gln Cys Leu Thr Thr
            340                 345                 350

Cys Pro Ala Gly Thr Val Leu Asp Asp Gly Thr Ser Thr Asn Phe Val
        355                 360                 365

Ala Ser Ala Thr Glu Cys Thr Lys Cys Ser Ala Gly Phe Phe Ala Ser
    370                 375                 380

Lys Thr Thr Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr
385                 390                 395                 400

Lys Lys Leu Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr
                405                 410                 415

Gln Lys Val Gln Cys Ala Ser Thr Thr Phe Ala Lys Phe Leu Ser Ile
            420                 425                 430

Ser Leu Leu Phe Ile Ser Phe Tyr Leu Leu
        435                 440


<210> 7
<211> 468
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 7
Met Lys Asn Asn Ile Leu Val Ile Leu Ile Ile Ser Leu Phe Ile Asn
  1               5                  10                  15

Gln Ile Lys Ser Ala Asn Cys Pro Val Gly Thr Glu Thr Asn Thr Ala
             20                  25                  30

Gly Gln Val Asp Asp Leu Gly Thr Pro Ala Asn Cys Val Asn Cys Gln
         35                  40                  45

Lys Asn Phe Tyr Tyr Asn Asn Ala Ala Ala Phe Val Pro Gly Ala Ser
     50                  55                  60

Thr Cys Thr Pro Cys Pro Gln Lys Lys Asp Ala Gly Ala Gln Pro Asn
 65                  70                  75                  80

Pro Pro Ala Thr Ala Asn Leu Val Thr Gln Cys Asn Val Lys Cys Pro
                 85                  90                  95

Ala Gly Thr Ala Ile Ala Gly Gly Ala Thr Asp Tyr Ala Ala Ile Ile
            100                 105                 110

Thr Glu Cys Val Asn Cys Arg Ile Asn Phe Tyr Asn Glu Asn Ala Pro
        115                 120                 125

Asn Phe Asn Ala Gly Ala Ser Thr Cys Thr Ala Cys Pro Val Asn Arg
    130                 135                 140

Val Gly Gly Ala Leu Thr Ala Gly Asn Ala Ala Thr Ile Val Ala Gln
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145 150 155 160

Cys Asn Val Ala Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr
165 170 175

Thr Asp Tyr Val Arg Ser Phe Thr Glu Cys Val Lys Cys Arg Leu Asn
180 185 190

Phe Tyr Tyr Asn Gly Asn Asn Gly Asn Thr Pro Phe Asn Pro Gly Lys
195 200 205

Ser Gln Cys Thr Pro Cys Pro Ala Ile Lys Pro Ala Asn Val Ala Gln
210 215 220

Ala Thr Leu Gly Asn Asp Ala Thr Ile Thr Ala Gln Cys Asn Val Ala
225 230 235 240

Cys Pro Asp Gly Thr Ile Ser Ala Ala Gly Val Asn Asn Trp Val Ala
245 250 255

Gln Asn Thr Glu Cys Thr Asn Cys Ala Pro Asn Phe Tyr Asn Asn Asn
260 265 270

Ala Pro Asn Phe Asn Pro Gly Asn Ser Thr Cys Leu Pro Cys Pro Ala
275 280 285

Asn Lys Asp Tyr Gly Ala Glu Ala Thr Ala Gly Gly Ala Ala Thr Leu
290 295 300

Ala Lys Gln Cys Asn Ile Ala Cys Pro Asp Gly Thr Ala Ile Ala Ser
305 310 315 320

Gly Ala Thr Asn Tyr Val Ile Leu Gln Thr Glu Cys Leu Asn Cys Ala
325 330 335

Ala Asn Phe Tyr Phe Asp Gly Asn Asn Phe Gln Ala Gly Ser Ser Arg
340 345 350

Cys Lys Ala Cys Pro Ala Asn Lys Val Gln Gly Ala Val Ala Thr Ala
355 360 365

Gly Gly Thr Ala Thr Leu Ile Ala Gln Cys Ala Leu Glu Cys Pro Ala
370 375 380

Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys Gln Ala Ala
385 390 395 400

Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr Lys Gln Thr
405 410 415

Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu
420 425 430

Thr Ser Gly Ala Glu Ala Asn Leu Pro Glu Ser Ala Lys Lys Asn Ile
435 440 445

Gln Cys Asp Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser
450 455 460

Tyr Tyr Leu Leu
465

<210> 8
<211> 83
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 8
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1 5 10 15

Ala Asp Leu Gly Thr Cys Val Asn Cys Arg Pro Asn Phe Tyr Tyr Asn
20 25 30

Gly Gly Ala Ala Gln Gly Glu Ala Asn Gly Asn Gln Pro Phe Ala Ala
35 40 45

Asn Asn Ala Ala Arg Gly Ile Cys Val Pro Cys Gln Ile Asn Arg Val
50 55 60

Gly Ser Val Thr Asn Ala Gly Asp Leu Ala Thr Leu Ala Thr Gln Cys
65 70 75 80

Ser Thr Gln

<210> 9
<211> 89
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 9
Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr Asp Val Phe Asp
1 5 10 15

Arg Ser Ala Ala Gln Cys Val Lys Cys Lys Pro Asn Phe Tyr Tyr Asn
20 25 30

Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala
35 40 45

Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro
50 55 60

Cys Gln Leu Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala
65 70 75 80

Asn Leu Ala Thr Gln Cys Ser Asn Gln
85

<210> 10
<211> 89
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 10
Cys Pro Thr Gly Thr Val Leu Asp Asp Gly Val Thr Leu Val Phe Asn
1 5 10 15

Thr Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr Tyr Asn
20 25 30

Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala

35 40 45

Gly Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro
50 55 60

Cys Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala
65 70 75 80

Asn Leu Ala Thr Gln Cys Ser Thr Gln
85

<210> 11
<211> 69
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 11
Cys Pro Thr Gly Thr Ala Ile Gln Asp Gly Val Thr Leu Val Phe Ser
1 5 10 15

Asn Ser Ser Thr Gln Cys Ser Gln Cys Ile Ala Asn Tyr Phe Phe Asn
20 25 30

Gly Asn Phe Glu Ala Gly Lys Ser Gln Cys Leu Lys Cys Pro Val Ser
35 40 45

Lys Thr Thr Pro Ala His Ala Pro Gly Asn Thr Ala Thr Gln Ala Thr
50 55 60

Gln Cys Leu Thr Thr
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<210> 12
<211> 72
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 12
Cys Pro Ala Gly Thr Val Leu Asp Asp Gly Thr Ser Thr Asn Phe Val
1 5 10 15

Ala Ser Ala Thr Glu Cys Thr Lys Cys Ser Ala Gly Phe Phe Ala Ser
20 25 30

Lys Thr Thr Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr
35 40 45

Lys Lys Leu Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr
50 55 60

Gln Lys Val Gln Cys Ala Ser Thr
65 70

<210> 13
<211> 14
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 13
Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu Leu

1 5 10

<210> 14
<211> 23
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 14
Gln Cys Ala Ser Thr Thr Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu
1 5 10 15

Phe Ile Ser Phe Tyr Leu Leu
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<210> 15
<211> 20
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 15
Met Lys Asn Asn Ile Leu Val Ile Leu Ile Ile Ser Leu Phe Ile Asn
1 5 10 15

Gln Ile Lys Ser
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<210> 16
<211> 14
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 16
Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser Tyr Tyr Leu Leu
1 5 10

<210> 17
<211> 20
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 17
Gln Cys Asp Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser
1 5 10 15

Tyr Tyr Leu Leu
20

<210> 18
<211> 33
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 18
Lys Val Tyr Ala Glu Ala Thr Gln Lys Val Gln Cys Ala Ser Thr Thr
1 5 10 15

Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu
20 25 30

Leu

<210> 19
<211> 60
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 19
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<210> 20
<211> 60
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 20
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<210> 21
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: antisense primer

<400> 21
agcagcacct acatcagtca atcc 24

<210> 22
<211> 17
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: universal primer

<400> 22
gtaaaacgac ggccagt 17

<210> 23
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: EPBdT18 primer

<400> 23
gcgaattctg caggatccaa actttttttt tttttttttt 40

<210> 24

<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 24
gtgtcgacag caggtactga tacatg 26

<210> 25
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 25
cgaaaacagt ggtggtagta cctt 24

<210> 26
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 26
gcgaattctg caggatccaa ac 22

<210> 27
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: oligonucleotide probe

<400> 27
agcagcacca acatcagtca aacc 24

<210> 28
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 28
atggtaatta acctttcgca gcaaataa 28

<210> 29
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 29
ggtctgcatt taacacataa 20

<210> 30
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 30
agatacatca gtatacgaaa 20

<210> 31
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primary structure motif

<220>
<221> UNSURE
<222> (2)..(3)
<223> amino acid

<400> 31
Cys Xaa Xaa Cys
1

<210> 32
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primary structure motif

<220>
<221> UNSURE
<222> (2)..(4)
<223> amino acid

<400> 32
Cys Xaa Xaa Xaa Cys
1 5

<210> 33
<211> 53
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: repeating primary structure motif

<220>
<221> UNSURE
<222> (2)..(3)
<223> amino acid

<220>
<221> UNSURE
<222> (5)..(24)
<223> amino acid

<220>
<221> UNSURE
<222> (26)..(28)
<223> amino acid

<220>
<221> UNSURE
<222> (30)..(49)
<223> amino acid

<220>
<221> UNSURE
<222> (51)..(52)
<223> amino acid

<400> 33
Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Cys Xaa Xaa Xaa
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Cys Xaa Xaa Cys
50

<210> 34
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: i-antigen P-loop domain

<220>
<221> UNSURE
<222> (2)..(5)

<400> 34
Gly Xaa Xaa Xaa Xaa Gly Lys Ser
1 5

<210> 35
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: sense primer

<400> 35
atgaaataya ayattttatt aatt 24

<210> 36
<211> 8
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 36
Met Lys Tyr Asn Ile Leu Leu Thr
1 5

<210> 37
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: antisense primer

<400> 37
aaataataar gaaatmgata aaaa 24

<210> 38
<211> 8
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 38
Phe Leu Ser Ile Ser Leu Leu Phe
1 5

<210> 39
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: antisense primer

<400> 39
tgctcgagaa tctgttgctc cacctg 26

<210> 40
<211> 52
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 40
ccagtgagca gagtgacgag gactcgagct caagcccccc ccccccccc cc 52

<210> 41
<211> 18
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 41
gaggactcga gctcaagc 18

<210> 42
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 42
aactcgagta ccagcagggc atttaac 27

<210> 43
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 43
cacaccttgt ccggcaatta aac 23

<210> 44
<211> 1410
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 44
atgaaaaata atattttagt aatattgatt atttcattat ttatcaatta aattaaatct 60
gctaattgtc ctgttggaac tgaaactaac acagccggat aagttgatga tctaggaact 120
cctgcaaatt gtgttaattg ttagaaaaac ttttattata ataatgctgc tgctttcgtt 180
cctggtgcta gtacgtgtac accttgtcca taaaaaaaag atgctggtgc ttaaccaaat 240
ccacctgcta ctgctaattt agtcacataa tgtaacgtta aatgccctgc tggtaccgca 300
attgcaggtg gagcaacaga ttatgcagca ataatcacag aatgtgttaa ttgtagaatt 360

aatttttata atgaaaatgc tccaaatttt aatgcaggtg ctagtacatg cacagcttgt 420
ccggtaaaca gagttggtgg tgcattgact gctggtaatg ccgctaccat agtcgcataa 480
tgtaacgtcg catgtcctac tggtactgca cttgatgatg gagtaactac tgattatgtt 540
agatcattca cagaatgtgt taaatgtaga cttaactttt actataatgg taataatggt 600
aatactcctt tcaatccagg taaaagttaa tgcacacctt gtccggcaat taaacctgct 660
aatgttgctt aagctacttt aggtaatgat gctacaataa ccgcataatg taacgttgca 720
tgccctgatg gtactataag tgctgctgga gtaaataatt gggtagcaca aaacactgaa 780
tgtactaatt gtgctcctaa cttttacaat aataatgctc ctaatttcaa tccaggtaat 840
agtacatgcc taccttgccc agcaaataaa gattatggtg ctgaagccac tgcaggtggt 900
gccgctactt tagccaaata atgtaatatt gcatgccctg atggtactgc aattgctagt 960
ggagcaacta attatgtaat attataaaca gaatgtctaa attgtgctgc taacttttat 1020
tttgatggta ataatttcta ggcaggaagt agtagatgca aagcatgtcc agcaaataaa 1080
gtttaaggcg ctgtagcaac tgcaggtggt actgctactt taattgcata atgtgccctt 1140
gaatgccctg ctggtactgt actcaccgat ggaacaacat ctacttataa ataagcagca 1200
tctgaatgtg ttaaatgtgc tgccaacttt tatactacaa aataaactga ttgggtagca 1260
ggtattgata catgtactag ttgtaataaa aaattaactt ctggcgctga agctaattta 1320
cctgaatctg ctaaaaaaaa tatataatgt gatttcgcta atttttatc aatttcctta 1380
ttattgattt cttattattt attatgatga 1410

<210> 45
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: forward primer

<400> 45
ccgaattctc tggyactgca cttgatgatg gag 33

<210> 46
<211> 8
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 46
Gly Thr Ala Leu Asp Asp Gly Val
1 5

<210> 47
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 47
gtggatccag tacatgttac artacctgc 29

<210> 48
<211> 7
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 48
Ala Gly Thr Asp Thr Cys Thr

1 5

<210> 49
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 49
gtggatccrc cagaagttaa ttttttakta c 31

<210> 50
<211> 9
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 50
Cys Thr Lys Lys Leu Thr Ser Gly Ala
1 5

<210> 51
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: reverse primer

<400> 51
gtggatccaa ggaaatygat aaaaawttag cg 32

<210> 52
<211> 9
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 52
Phe Ala Lys Phe Leu Ser Ile Ser Leu
1 5

<210> 53
<211> 1404
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: synthetic G5 proline mutant i-antigen

<400> 53
atgaagaaca acatcccggt gatcctgatc atctctctgt tcatcaacca gatcaagtct 60
gctaactgtc ctgtgggaac cgagaccaac accgctggac aggtggacga cctgggaacc 120
cctgctaact gtgtgaactg tcagaagaac ttctactaca acaacgctgc tgctttcgtg 180
cctggagctt ctacctgtac cccttgtcct cagaagaagg acgctggagc tcagcctaac 240

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cctcctgcta ccgctaacct ggtgacccag tgtaacgtga agtgtcctgc tggaaccgct 300
atcgctggag gagctaccga ctacgctgct atcatcaccg agtgtgtgaa ctgtcgcatc 360
aacttctaca acgagaacgc tcctaacttc aacgctggag cttctacctg taccgcttgt 420
cctgtgaacc gtgtgggagg agctctgacc gctggaaacg ctgctaccat cgtggctcag 480
tgtaacgtgg cttgtcctac cggaaccgct ctggacgacg gagtgaccac cgactacgtg 540
cgctctttca ccgagtgtgt gaagtgtcgc ctgaacttct actacaacgg aaacaacgga 600
aacacccctt tcaaccctgg aaagtctcag tgtacccctt gtcctgctat caagcctgct 660
aacgtggctc aggctaccct gggaaacgac gctaccatca ccgctcagtg taacgtggct 720
tgtcctgacg gaaccatctc tgctgctgga gtgaacaact gggtggctca gaacaccgag 780
tgtaccaact gtgctcctaa cttctacaac aacaacgctc ctaacttcaa ccctggaaac 840
tctacctgtc tgccttgtcc tgctaacaag gactacggag ctgaggctac cgctggagga 900
gctgctaccc tggctaagca gtgtaacatc gcttgtcctg acggaaccgc tatcgcttct 960
ggagctacca actacgtgat cctgcagacc gagtgtctga actgtgctgc taacttctac 1020
ttcgacggaa acaacttcca ggctggatct tctcgctgta aggcttgtcc tgctaacaag 1080
gtgcagggag ctgtggctac cgctggagga accgctaccc tgatcgctca gtgtgctctg 1140
gagtgtcctg ctggaaccgt gctgaccgac ggaaccacct ctacctacaa gcaggctgct 1200
tctgagtgtg tgaagtgtgc tgctaacttc tacaccacca agcagaccga ctgggtggct 1260
ggaatcgaca cctgtacctc ttgtaacaag aagctgacct ctggagctga ggctaacctg 1320
cctgagtctg ctaagaagaa catccagtgt gacttcgcta acttcctgtc tatctctctg 1380
ctgctgatct cttactacct gctg                                       1404
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<210> 54
<211> 468
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: synthetic G5 proline mutant antigen protein

<400> 54

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Met Lys Asn Asn Ile Pro Val Ile Leu Ile Ile Ser Leu Phe Ile Asn
  1               5                  10                  15

Gln Ile Lys Ser Ala Asn Cys Pro Val Gly Thr Glu Thr Asn Thr Ala
             20                  25                  30

Gly Gln Val Asp Asp Leu Gly Thr Pro Ala Asn Cys Val Asn Cys Gln
         35                  40                  45

Lys Asn Phe Tyr Tyr Asn Asn Ala Ala Ala Phe Val Pro Gly Ala Ser
     50                  55                  60

Thr Cys Thr Pro Cys Pro Gln Lys Lys Asp Ala Gly Ala Gln Pro Asn
 65                  70                  75                  80

Pro Pro Ala Thr Ala Asn Leu Val Thr Gln Cys Asn Val Lys Cys Pro
                 85                  90                  95

Ala Gly Thr Ala Ile Ala Gly Gly Ala Thr Asp Tyr Ala Ala Ile Ile
            100                 105                 110

Thr Glu Cys Val Asn Cys Arg Ile Asn Phe Tyr Asn Glu Asn Ala Pro
        115                 120                 125

Asn Phe Asn Ala Gly Ala Ser Thr Cys Thr Ala Cys Pro Val Asn Arg
    130                 135                 140

Val Gly Gly Ala Leu Thr Ala Gly Asn Ala Ala Thr Ile Val Ala Gln
145                 150                 155                 160

Cys Asn Val Ala Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr
```

165 170 175

Thr Asp Tyr Val Arg Ser Phe Thr Glu Cys Val Lys Cys Arg Leu Asn
180 185 190

Phe Tyr Tyr Asn Gly Asn Asn Gly Asn Thr Pro Phe Asn Pro Gly Lys
195 200 205

Ser Gln Cys Thr Pro Cys Pro Ala Ile Lys Pro Ala Asn Val Ala Gln
210 215 220

Ala Thr Leu Gly Asn Asp Ala Thr Ile Thr Ala Gln Cys Asn Val Ala
225 230 235 240

Cys Pro Asp Gly Thr Ile Ser Ala Ala Gly Val Asn Asn Trp Val Ala
245 250 255

Gln Asn Thr Glu Cys Thr Asn Cys Ala Pro Asn Phe Tyr Asn Asn Asn
260 265 270

Ala Pro Asn Phe Asn Pro Gly Asn Ser Thr Cys Leu Pro Cys Pro Ala
275 280 285

Asn Lys Asp Tyr Gly Ala Glu Ala Thr Ala Gly Gly Ala Ala Thr Leu
290 295 300

Ala Lys Gln Cys Asn Ile Ala Cys Pro Asp Gly Thr Ala Ile Ala Ser
305 310 315 320

Gly Ala Thr Asn Tyr Val Ile Leu Gln Thr Glu Cys Leu Asn Cys Ala
325 330 335

Ala Asn Phe Tyr Phe Asp Gly Asn Asn Phe Gln Ala Gly Ser Ser Arg
340 345 350

Cys Lys Ala Cys Pro Ala Asn Lys Val Gln Gly Ala Val Ala Thr Ala
355 360 365

Gly Gly Thr Ala Thr Leu Ile Ala Gln Cys Ala Leu Glu Cys Pro Ala
370 375 380

Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys Gln Ala Ala
385 390 395 400

Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr Lys Gln Thr
405 410 415

Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu
420 425 430

Thr Ser Gly Ala Glu Ala Asn Leu Pro Glu Ser Ala Lys Lys Asn Ile
435 440 445

Gln Cys Asp Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser
450 455 460

Tyr Tyr Leu Leu
465

<210> 55
<211> 72
<212> PRT

<213> Ichthyophthirius multifiliis

<400> 55
Cys Pro Val Gly Thr Glu Thr Asn Thr Ala Gly Gln Val Asp Asp Leu
1 5 10 15

Gly Thr Pro Ala Asn Cys Val Asn Cys Gln Lys Asn Phe Tyr Tyr Asn
20 25 30

Asn Ala Ala Ala Phe Val Pro Gly Ala Ser Thr Cys Thr Pro Cys Pro
35 40 45

Gln Lys Lys Asp Ala Gly Ala Gln Pro Asn Pro Pro Ala Thr Ala Asn
50 55 60

Leu Val Thr Gln Cys Asn Val Lys
65 70

<210> 56
<211> 70
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 56
Cys Pro Ala Gly Thr Ala Ile Ala Gly Gly Ala Thr Asp Tyr Ala Ala
1 5 10 15

Ile Ile Thr Glu Cys Val Asn Cys Arg Ile Asn Phe Tyr Asn Glu Asn
20 25 30

Ala Pro Asn Phe Asn Ala Gly Ala Ser Thr Cys Thr Ala Cys Pro Val
35 40 45

Asn Arg Val Gly Gly Ala Leu Thr Ala Gly Asn Ala Ala Thr Ile Val
50 55 60

Ala Gln Cys Asn Val Ala
65 70

<210> 57
<211> 76
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 57
Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr Thr Asp Tyr Val
1 5 10 15

Arg Ser Phe Thr Glu Cys Val Lys Cys Arg Leu Asn Phe Tyr Tyr Asn
20 25 30

Gly Asn Asn Gly Asn Thr Pro Phe Asn Pro Gly Lys Ser Gln Cys Thr
35 40 45

Pro Cys Pro Ala Ile Lys Pro Ala Asn Val Ala Gln Ala Thr Leu Gly
50 55 60

Asn Asp Ala Thr Ile Thr Ala Gln Cys Asn Val Ala
65 70 75

<210> 58
<211> 71
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 58
Cys Pro Asp Gly Thr Ile Ser Ala Ala Gly Val Asn Asn Trp Val Ala
1 5 10 15

Gln Asn Thr Glu Cys Thr Asn Cys Ala Pro Asn Phe Tyr Asn Asn Asn
20 25 30

Ala Pro Asn Phe Asn Pro Gly Asn Ser Thr Cys Leu Pro Cys Pro Ala
35 40 45

Asn Lys Asp Tyr Gly Ala Glu Ala Thr Ala Gly Gly Ala Ala Thr Leu
50 55 60

Ala Lys Gln Cys Asn Ile Ala
65 70

<210> 59
<211> 70
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 59
Cys Pro Asp Gly Thr Ala Ile Ala Ser Gly Ala Thr Asn Tyr Val Ile
1 5 10 15

Leu Gln Thr Glu Cys Leu Asn Cys Ala Ala Asn Phe Tyr Phe Asp Gly
20 25 30

Asn Asn Phe Gln Ala Gly Ser Ser Arg Cys Lys Ala Cys Pro Ala Asn
35 40 45

Lys Val Gln Gly Ala Val Ala Thr Ala Gly Gly Thr Ala Thr Leu Ile
50 55 60

Ala Gln Cys Ala Leu Glu
65 70

<210> 60
<211> 72
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 60
Cys Pro Ala Gly Thr Val Leu Thr Asp Gly Thr Thr Ser Thr Tyr Lys
1 5 10 15

Gln Ala Ala Ser Glu Cys Val Lys Cys Ala Ala Asn Phe Tyr Thr Thr
20 25 30

Lys Gln Thr Asp Trp Val Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn
35 40 45

Lys Lys Leu Thr Ser Gly Ala Glu Ala Asn Leu Pro Glu Ser Ala Lys
50 55 60

Lys Asn Ile Gln Cys Asp Phe Ala

65 70

<210> 61
<211> 409
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 61

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Ala Val Pro Cys Pro Asp Gly Thr Gln Thr Gln Ala Gly Leu Thr Asp
  1               5                  10                  15

Val Gly Ala Ala Asp Leu Gly Thr Cys Val Asn Cys Arg Pro Asn Phe
             20                  25                  30

Tyr Tyr Asn Gly Gly Ala Ala Gln Gly Glu Ala Asn Gly Asn Gln Pro
         35                  40                  45

Phe Ala Ala Asn Asn Ala Ala Arg Gly Ile Cys Val Pro Cys Gln Ile
     50                  55                  60

Asn Arg Val Gly Ser Val Thr Asn Ala Gly Asp Leu Ala Thr Leu Ala
 65                  70                  75                  80

Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly
                 85                  90                  95

Val Thr Asp Val Phe Asp Arg Ser Ala Ala Gln Cys Val Lys Cys Lys
            100                 105                 110

Pro Asn Phe Tyr Tyr Asn Gly Gly Ser Pro Gln Gly Glu Ala Pro Gly
        115                 120                 125

Val Gln Val Phe Ala Ala Gly Ala Ala Ala Ala Gly Val Ala Ala Val
    130                 135                 140

Thr Ser Gln Cys Val Pro Cys Gln Leu Asn Lys Asn Asp Ser Pro Ala
145                 150                 155                 160

Thr Ala Gly Ala Gln Ala Asn Leu Ala Thr Gln Cys Ser Asn Gln Cys
                165                 170                 175

Pro Thr Gly Thr Val Leu Asp Asp Gly Val Thr Leu Val Phe Asn Thr
            180                 185                 190

Ser Ala Thr Leu Cys Val Lys Cys Arg Pro Asn Phe Tyr Tyr Asn Gly
        195                 200                 205

Gly Ser Pro Gln Gly Glu Ala Pro Gly Val Gln Val Phe Ala Ala Gly
    210                 215                 220

Ala Ala Ala Ala Gly Val Ala Ala Val Thr Ser Gln Cys Val Pro Cys
225                 230                 235                 240

Gln Ile Asn Lys Asn Asp Ser Pro Ala Thr Ala Gly Ala Gln Ala Asn
                245                 250                 255

Leu Ala Thr Gln Cys Ser Thr Gln Cys Pro Thr Gly Thr Ala Ile Gln
            260                 265                 270

Asp Gly Val Thr Leu Val Phe Ser Asn Ser Ser Thr Gln Cys Ser Gln
        275                 280                 285
```

```
Cys Ile Ala Asn Tyr Phe Phe Asn Gly Asn Phe Glu Ala Gly Lys Ser
    290                 295                 300

Gln Cys Leu Lys Cys Pro Val Ser Lys Thr Thr Pro Ala His Ala Pro
305                 310                 315                 320

Gly Asn Thr Ala Thr Gln Ala Thr Gln Cys Leu Thr Thr Cys Pro Ala
                325                 330                 335

Gly Thr Val Leu Asp Asp Gly Thr Ser Thr Asn Phe Val Ala Ser Ala
            340                 345                 350

Thr Glu Cys Thr Lys Cys Ser Ala Gly Phe Phe Ala Ser Lys Thr Thr
        355                 360                 365

Gly Phe Thr Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr Lys Lys Leu
    370                 375                 380

Thr Ser Gly Ala Thr Ala Lys Val Tyr Ala Glu Ala Thr Gln Lys Val
385                 390                 395                 400

Gln Cys Ala Ser Thr Thr Phe Ala Lys
                405
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<210> 62
<211> 399
<212> PRT
<213> Giardia lamblia virus

<400> 62

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Ala Val Asp Cys Gln Gly Ser Ala Gly Tyr Tyr Thr Asp Asp Ser Val
  1               5                  10                  15

Ser Asp Ala Lys Glu Cys Lys Lys Cys Asn Ala Pro Cys Thr Ala Cys
            20                  25                  30

Ala Gly Thr Ala Asp Lys Cys Thr Lys Cys Asp Ala Asn Gly Ala Ala
        35                  40                  45

Pro Tyr Leu Lys Lys Thr Asn Pro Ser Asp Pro Thr Gly Thr Cys Val
    50                  55                  60

Ser Ala Val Asp Cys Gln Gly Ser Ala Gly Tyr Tyr Thr Asp Asp Ser
65                  70                  75                  80

Val Ser Asp Ala Lys Glu Cys Lys Lys Cys Ala Glu Gly Gln Lys Pro
                85                  90                  95

Asn Thr Ala Gly Thr Gln Cys Phe Ser Cys Ser Asp Ala Asn Cys Glu
            100                 105                 110

Arg Cys Asp Gln Asn Asp Val Cys Ala Arg Cys Ser Thr Gly Ala Pro
        115                 120                 125

Pro Glu Asn Gly Lys Cys Pro Ala Ala Thr Pro Gly Cys His Ser Ser
    130                 135                 140

Cys Asp Gly Cys Thr Glu Asn Ala Met Thr Asn Gln Ala Asp Lys Cys
145                 150                 155                 160

Thr Gly Cys Lys Glu Gly Arg Tyr Leu Lys Pro Glu Ser Ala Ala Gly
                165                 170                 175
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```
Gln Ser Gly Thr Cys Leu Thr Ala Glu Glu Cys Thr Ser Asp Thr Thr
            180                 185                 190

His Phe Thr Lys Glu Lys Ala Gly Asp Ser Lys Gly Met Cys Leu Pro
        195                 200                 205

Cys Ser Asp Ala Thr His Gly Ile Ala Gly Cys Lys Lys Cys Ala Leu
    210                 215                 220

Lys Thr Leu Ser Gly Glu Ala Glu Ser Thr Val Val Cys Ser Glu Cys
225                 230                 235                 240

Thr Asp Lys Trp Leu Thr Pro Ser Gly Asn Ala Cys Leu Asp Asn Cys
                245                 250                 255

Pro Ala Gly Thr Tyr Pro Asn Asp Asn Asn Leu Cys Thr Ser Cys His
            260                 265                 270

Asp Thr Cys Ala Glu Cys Asn Gly Asn Ala Asp Arg Ala Ser Cys Thr
        275                 280                 285

Ala Cys Tyr Pro Gly Tyr Ser Leu Leu Tyr Gly Ser Cys Thr Ala Gly
    290                 295                 300

Thr Cys Val Lys Glu Cys Thr Gly Ala Phe Gly Ala Asn Cys Ala Asp
305                 310                 315                 320

Gly Gln Cys Thr Ala Asp Val Gly Gly Ala Lys Tyr Cys Ala Gln Cys
                325                 330                 335

Lys Asp Gly Tyr Ala Pro Ile Asp Gly Ile Cys Thr Ala Val Ala Ala
            340                 345                 350

Ala Gly Arg Thr Asn Val Cys Thr Ala Ala Asp Gly Thr Cys Thr Lys
        355                 360                 365

Cys Ala Gly Glu Tyr Thr Leu Met Ser Gly Gly Cys Tyr Gly Val Ala
    370                 375                 380

Lys Leu Pro Gly Lys Ser Val Cys Thr Leu Ala Ser Asn Gly Lys
385                 390                 395


<210> 63
<211> 5
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 63
Val Asn Ile His Gln
  1               5


<210> 64
<211> 77
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 64
gtaaatatcc attaatgaag cttcgaaaac agtggtggta gtaccttatt catgcttgaa 60
gtatttagaa tcaagag                                                 77
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<210> 65
<211> 33
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 65
Lys Val Tyr Ala Glu Ala Thr Gln Lys Val Gln Cys Ala Ser Thr Thr
1 5 10 15

Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu
20 25 30

Leu

<210> 66
<211> 202
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 66
aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60
ttatcgattt ccttattatt tatttctttc tatttattgt gatgaataaa ataattcata 120
ttatttttatt tttttatttt atgtttataa attaaaaaat agataaaatt taaaatatat 180
taaaaataat tttttatata aa 202

<210> 67
<211> 199
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 67
aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60
ttatcgattt ccttattatt tatttctttc tatttattgt gattaataaa ataattcata 120
ttatttttatt tttttatttt atgtttataa attaaaaaat agataaaatt taaaatatat 180
taaaaaaaaa aaaaaaaaa 199

<210> 68
<211> 162
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 68
aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60
ttatcgattt ccttattatt tatttctttc tatttattgt gatgaataaa ataattcata 120
ttatttttatt tttttatttt atgtttataa attaaaaaat ag 162

<210> 69
<211> 119
<212> DNA
<213> Ichthyophthirius multifiliis

<400> 69
aaagtatatg ctgaagctac tcaaaaagta taatgcgcct ccactacttt cgctaaattt 60
ttatcgattt ccttattatt tatttctttc tatttattgt gatgaataaa ataattcat 119

<210> 70

<211> 117
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 70
atgggaattc aaatgaagaa caacatcctg gtgatcctga tcatctctct gttcatcaac 60
cagatcaagt ctgctaactg tcctgtggga accgagacca acaccgctgg acaggtg 117

<210> 71
<211> 104
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 71
ctccaggcac gaaagcagca gcgttgttgt agtagaagtt cttctgacag ttcacacagt 60
tagcaggggt tcccaggtcg tccacctgtc cagcggtgtt ggtc 104

<210> 72
<211> 100
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 72
cgctgctgct ttcgtgcctg gagcttctac ctgtacccct tgtcctcaga agaaggacgc 60
tggagctcag cctaaccctc ctgctaccgc taacctggtg 100

<210> 73
<211> 95
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 73
gatgatagca gcgtagtcgg tagctcctcc agcgatagcg gttccagcag gacacttcac 60
gttacactgg gtcaccaggt tagcggtagc aggag 95

<210> 74
<211> 138
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 74
gctaccgact acgctgctat catcaccgag tgtgtgaact gtcgcatcaa cttctacaac 60
gagaacgctc ctaacttcaa cgctggagct tctacctgta ccgcttgtcc tgtgaaccgc 120
gtgggaggag ctctgacc 138

<210> 75
<211> 123
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 75
ggtgaaagag cgcacgtagt cggtggtcac tccgtcgtcc agagcggttc cggtaggaca 60
agccacgtta cactgagcca cgatggtagc agcgtttcca gcggtcagag ctcctcccac 120
gcg 123

<210> 76
<211> 99
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 76
gactacgtgc gctctttcac cgagtgtgtg aagtgtcgcc tgaacttcta ctacaacgga 60
aacaacggaa acaccccttt caaccctgga aagtctcag 99

<210> 77
<211> 95
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 77
gtgatggtag cgtcgtttcc cagggtagcc tgagccacgt tagcaggctt gatagcagga 60
caaggggtac actgagactt tccagggttg aaagg 95

<210> 78
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 78
gggaaacgac gctaccatca ccgctcagtg taacgtggct tgtcctgacg gaaccatctc 60
tgctgctgga gtgaacaact gggtggctca gaac 94

<210> 79
<211> 100
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 79
cagacaggta gagtttccag ggttgaagtt aggagcgttg ttgttgtaga agttaggagc 60
acagttggta cactcggtgt tctgagccac ccagttgttc 100

<210> 80
<211> 89
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 80
ccctggaaac tctacctgtc tgccttgtcc tgctaacaag gactacggag ctgaggctac 60
cgctggagga gctgctaccc tggctaagc 89

<210> 81
<211> 90
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 81
ggtctgcagg atcacgtagt tggtagctcc agaagcgata gcggttccgt caggacaagc 60
gatgttacac tgcttagcca gggtagcagc 90

<210> 82
<211> 95
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 82
caactacgtg atcctgcaga ccgagtgtct gaactgtgct gctaacttct acttcgacgg 60
aaacaacttc caggctggat cttctcgctg taagg 95

<210> 83
<211> 92
<212> DNA
<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 83
gagcgatcag ggtagcggtt cctccagcgg tagccacagc tccctgcacc ttgttagcag 60
gacaagcctt acagcgagaa gatccagcct gg 92

<210> 84
<211> 94
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 84
gaaccgctac cctgatcgct cagtgtgctc tggagtgtcc tgctggaacc gtgctgaccg 60
acggaaccac ctctacctac aagcaggctg cttc 94

<210> 85
<211> 92
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 85
ggtgtcgatt ccagccaccc agtcggtctg cttggtggtg tagaagttag cagcacactt 60
cacacactca gaagcagcct gcttgtaggt ag 92

<210> 86
<211> 92
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 86
gggtggctgg aatcgacacc tgtacctctt gtaacaagaa gctgacctct ggagctgagg 60
ctaacctgcc tgagtctgct aagaagaaca tc 92

<210> 87
<211> 95
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence:
oligonucleotide primers

<400> 87
gagggatcct tattacagca ggtagtaaga gatcagcagc agagagatag acaggaagtt 60
agcgaagtca cactggatgt tcttcttagc agact 95

<210> 88
<211> 52
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: repeating primary structure motif

<220>
<221> UNSURE
<222> (2)..(3)
<223> amino acid

<220>
<221> UNSURE
<222> (5)..(24)
<223> amino acid

<220>
<221> UNSURE
<222> (26)..(28)
<223> amino acid

<220>
<221> UNSURE
<222> (31)..(48)
<223> amino acid

<220>
<221> UNSURE
<222> (50)..(51)
<223> amino acid

<400> 88
Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Xaa Cys Pro Xaa Xaa
20 25 30

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Cys Xaa Xaa Cys
50

<210> 89
<211> 58
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: repeating primary structure motif

<220>
<221> UNSURE
<222> (2)..(3)
<223> amino acid

<220>
<221> UNSURE
<222> (5)..(24)
<223> amino acid

<220>
<221> UNSURE
<222> (27)..(29)
<223> amino acid

<220>
<221> UNSURE
<222> (32)
<223> amino acid

<220>
<221> UNSURE
<222> (35)..(54)
<223> amino acid

<220>
<221> UNSURE
<222> (56)..(57)
<223> amino acid

<400> 89
Cys Xaa Xaa Cys Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Gln Cys Xaa Xaa Xaa Cys Pro Xaa
20 25 30

Gly Thr Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa
35 40 45

Xaa Xaa Xaa Xaa Xaa Xaa Cys Xaa Xaa Cys
50 55

<210> 90
<211> 16
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 90
Met Lys Tyr Asn Ile Leu Leu Ile Leu Ile Ile Ser Leu Phe Ile Asn
1 5 10 15

<210> 91
<211> 16
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 91
Met Lys Asn Asn Ile Leu Val Ile Leu Ile Ile Ser Leu Phe Ile Asn
1 5 10 15

<210> 92
<211> 12
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 92
Cys Pro Thr Gly Thr Ala Leu Asp Asp Gly Val Thr
1 5 10

<210> 93
<211> 13
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 93
Cys Val Lys Cys Lys Pro Asn Phe Tyr Tyr Asn Gly Gly
1 5 10

<210> 94
<211> 12
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 94
Cys Val Lys Cys Arg Leu Asn Phe Tyr Tyr Asn Gly
1 5 10

<210> 95
<211> 11
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 95
Cys Pro Ala Gly Thr Val Leu Asp Asp Gly Thr
1 5 10

<210> 96
<211> 11
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 96
Cys Pro Ala Gly Thr Val Leu Thr Asp Gly Thr
1 5 10

<210> 97
<211> 19
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 97
Ala Gly Thr Asp Thr Cys Thr Glu Cys Thr Lys Lys Leu Thr Ser Gly
1 5 10 15

Ala Thr Ala

<210> 98
<211> 19
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 98
Ala Gly Ile Asp Thr Cys Thr Ser Cys Asn Lys Lys Leu Thr Ser Gly
1 5 10 15

Ala Glu Ala

<210> 99
<211> 17
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 99
Phe Ala Lys Phe Leu Ser Ile Ser Leu Leu Phe Ile Ser Phe Tyr Leu
1 5 10 15

Leu

<210> 100
<211> 17
<212> PRT
<213> Ichthyophthirius multifiliis

<400> 100
Phe Ala Asn Phe Leu Ser Ile Ser Leu Leu Leu Ile Ser Tyr Tyr Leu
1 5 10 15

Leu

<210> 101
<211> 12
<212> PRT
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: short linker sequence

<400> 101
Gly Ser Gly Gly Gly Gly Ser Gly Gly Gly Gly Ser
1 5 10

<210> 102
<211> 1410
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: synthetic 55kD i-antigen coding region

<400> 102
atgaagaaca acatcctggt gatcctgatc atctctctgt tcatcaacca gatcaagtct 60
gctaactgtc ctgtgggaac cgagaccaac accgctggac aggtggacga cctgggaacc 120
cctgctaact gtgtgaactg tcagaagaac ttctactaca acaacgctgc tgctttcgtg 180
cctggagctt ctacctgtac cccttgtcct cagaagaagg acgctggagc tcagcctaac 240

cctcctgcta ccgctaacct ggtgacccag tgtaacgtga agtgtcctgc tggaaccgct 300
atcgctggag gagctaccga ctacgctgct atcatcaccg agtgtgtgaa ctgtcgcatc 360
aacttctaca acgagaacgc tcctaacttc aacgctggag cttctacctg taccgcttgt 420
cctgtgaacc gcgtgggagg agctctgacc gctggaaacg ctgctaccat cgtggctcag 480
tgtaacgtgg cttgtcctac cggaaccgct ctggacgacg gagtgaccac cgactacgtg 540
cgctctttca ccgagtgtgt gaagtgtcgc ctgaacttct actacaacgg aaacaacgga 600
aacacccctt tcaaccctgg aaagtctcag tgtacccctt gtcctgctat caagcctgct 660
aacgtggctc aggctaccct gggaaacgac gctaccatca ccgctcagtg taacgtggct 720
tgtcctgacg gaaccatctc tgctgctgga gtgaacaact gggtggctca gaacaccgag 780
tgtaccaact gtgctcctaa cttctacaac aacaacgctc ctaacttcaa ccctggaaac 840
tctacctgtc tgccttgtcc tgctaacaag gactacggag ctgaggctac cgctggagga 900
gctgctaccc tggctaagca gtgtaacatc gcttgtcctg acggaaccgc tatcgcttct 960
ggagctacca actacgtgat cctgcagacc gagtgtctga actgtgctgc taacttctac 1020
ttcgacggaa acaacttcca ggctggatct tctcgctgta aggcttgtcc tgctaacaag 1080
gtgcagggag ctgtggctac cgctggagga accgctaccc tgatcgctca gtgtgctctg 1140
gagtgtcctg ctggaaccgt gctgaccgac ggaaccacct ctacctacaa gcaggctgct 1200
tctgagtgtg tgaagtgtgc tgctaacttc tacaccacca agcagaccga ctgggtggct 1260
ggaatcgaca cctgtacctc ttgtaacaag aagctgacct ctggagctga ggctaacctg 1320
cctgagtctg ctaagaagaa catccagtgt gacttcgcta acttcctgtc tatctctctg 1380
ctgctgatct cttactacct gctgtaataa 1410